SEA-BIRD SCIENTIFIC

Application Note:
Real Time Nitrate and Phosphate Monitoring for Ecosystem Modelling

Background:

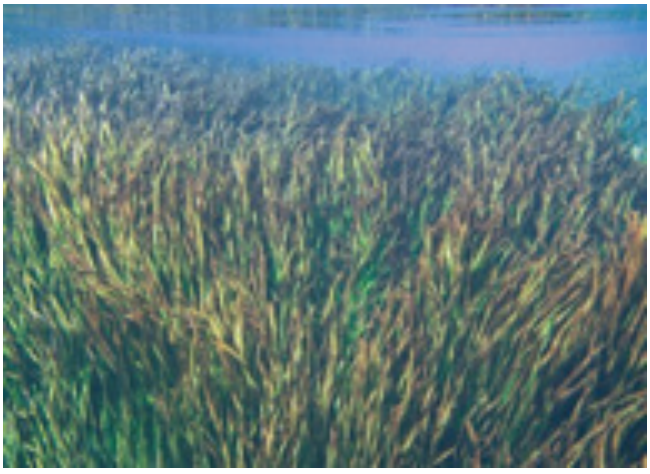
The karst springs of northern Florida drain the Floridan Aquifer, providing a unique window into a major Florida drinking water supply. The river ecosystems that the springs feed are incredibly productive and have been the focus of ecosystem research for over 60 years.

The flow, chemistry, and temperature of the springs are remarkably constant, allowing any variation in chemistry at a downstream location to be clearly attributed to that section of the river.

The Ecohydrology Laboratory at the University of Florida, with the support of the National Science Foundation and St. Johns River Water Management District, has been studying fine temporal scale variation in spring river water chemistry in response to day-night cycles.

From the diel signals in dissolved oxygen, pH, temperature, nitrate, and phosphate, the University of Florida is able to study the inner workings of these extraordinary ecosystems in real- time, with the help of the Sea-Bird SUNA nitrate sensor and Cycle-PO4 phosphate sensor

High water clarity at Ichetucknee Head Spring.
Credit:Larry V. Korhnak



Highly productive plant biomass in the Silver River.
Credit: Larry V. Korhnak

Task:

- Explore the diel signals of nitrate, phosphate, and other chemical attributes of Florida's spring- fed rivers
- Understand the fate, transport, and transformation of potentially harmful contaminants
- Develop new tools for understanding how river ecosystems couple nutrient and energy resources together

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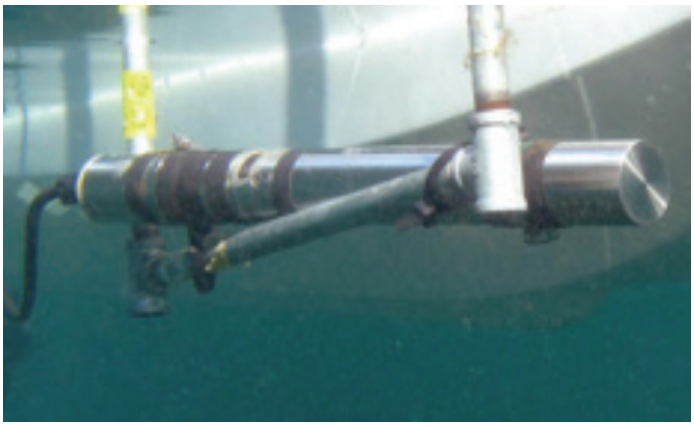
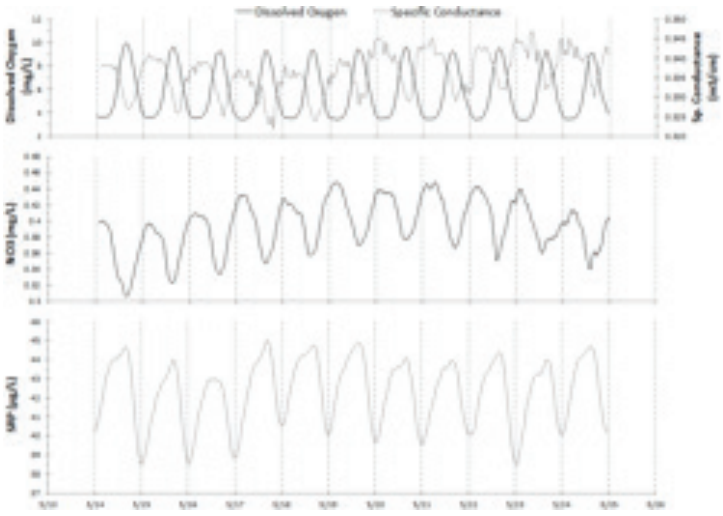
Monitoring Solution:

- The SUNA and Cycle were used for unattended monitoring in conjunction with a multiparameter sonde measuring pH, DO, temperature and specific conductance. Hourly measurements over multiple short term (8-14 day) deployments at sites 0.5 to 5 km downstream of spring vents.
- In addition the SUNA was used for longitudinal profiling, with a measurement resolution of 0.5 Hz.



SUNA deployed for longitudinal profiling.
Credit: Larry V. Korhnak



Sensor performance- May 2010. A) Multiparameter sonde for DO & specific conductance B) SUNA for Nitrate, C) Cycle-PO4 for phosphate. Vertical dashed lines denote midnight of each deployment day

Monitoring Solution:

- The SUNA and Cycle-PO4 provide unparalleled insight into the short term variation of nutrient concentrations in rivers because accuracy and precision of both instruments exceeds the accuracy of field samples analyzed using standard laboratory methods.
- Sensor calibrations are stable and sensor construction is robust.
- The temporal resolution is impractical to replicate without sensors. The Ecohydrology labratory at University of Florida has taken over 500,000 nitrate measurements with their SUNA's.
- The SUNA and Cycle-PO4 have opened up new avenues for understanding how river ecosystems process nutrients.

For more information on the monitoring project, visit the University of Florida Ecohydrology Lab site or contact Dr. Matthew Cohen at mjc@ufl.edu.

Article Citations:

Heffernan, J.B., and M.J. Cohen. 2010. Direct and indirect coupling of primary production and diel nitrate dynamics in a sub-tropical spring fed river. Limnology and Oceanography 55:677-688